

BRITISH # 21510

Screw Propellers, Form & Construction (11-1893)

SHEET 1

Fig. 1. A.

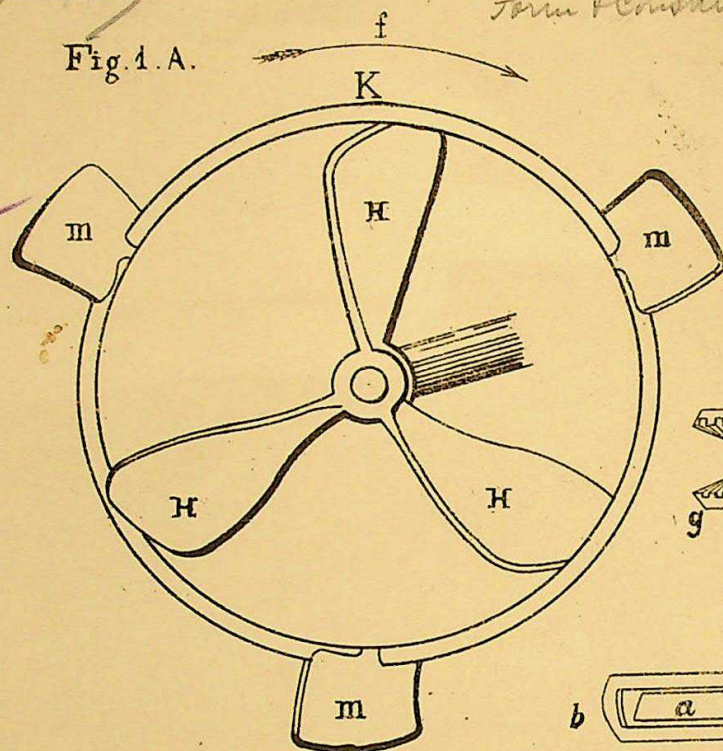


Fig. 2

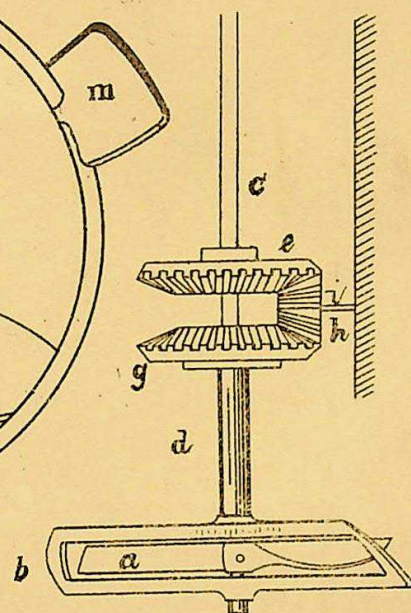
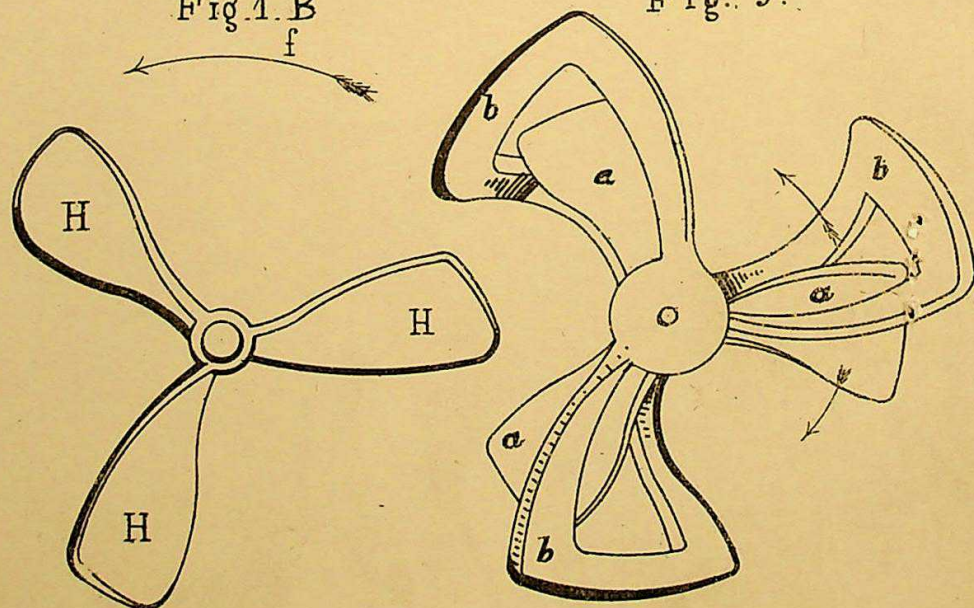


Fig. 3.

Fig. 1. B



21510
93

Screw Propellers, Form & Construction

(6 SHEETS)
SHEET 2.

Fig. 4 A

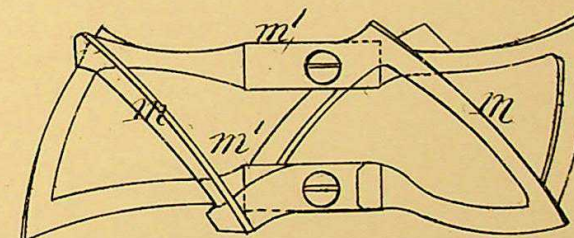
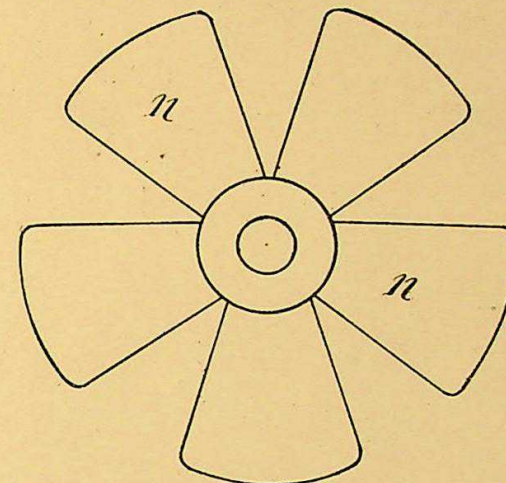
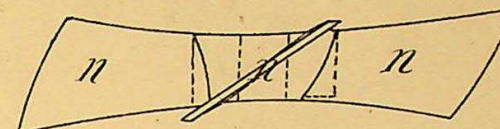
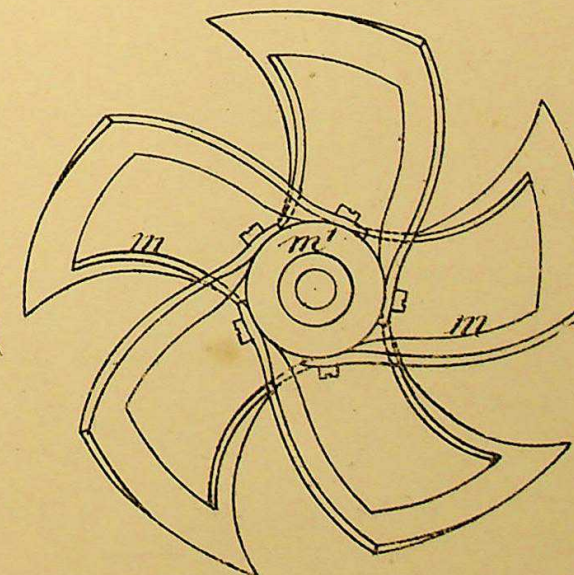


Fig. 4 B



115. MARINE PROPULSION
Screw Propellers.
Form and Construction.

[This Drawing is a reproduction of the Original on a reduced scale]

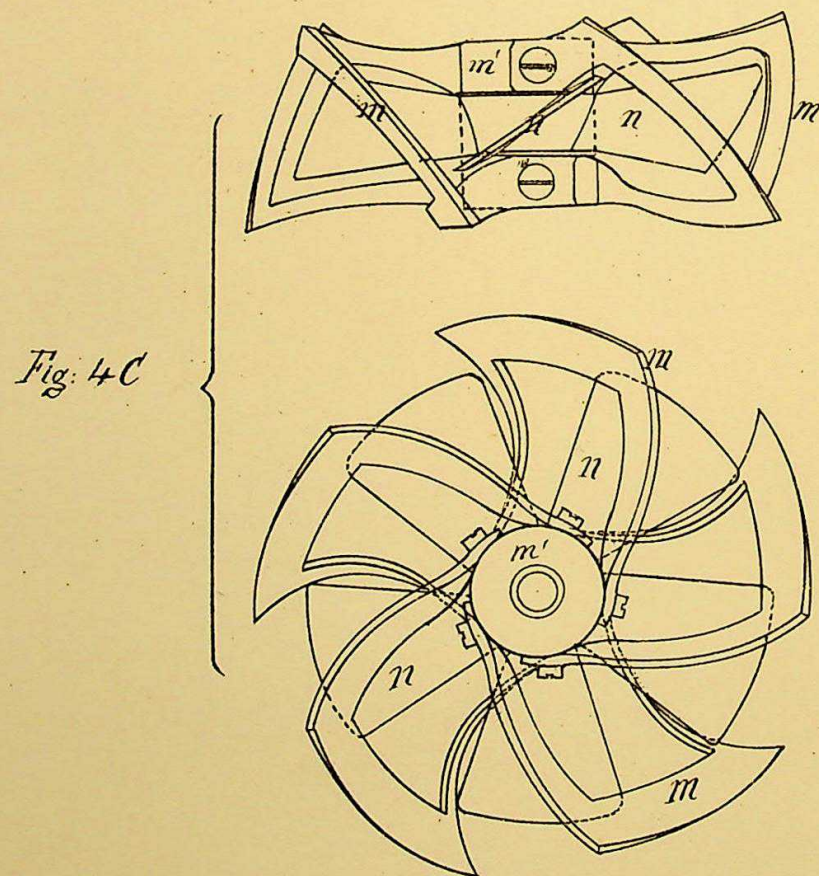


Fig: 4D

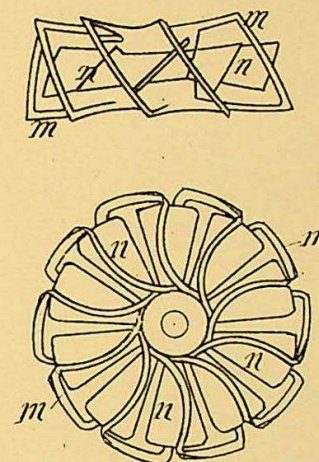
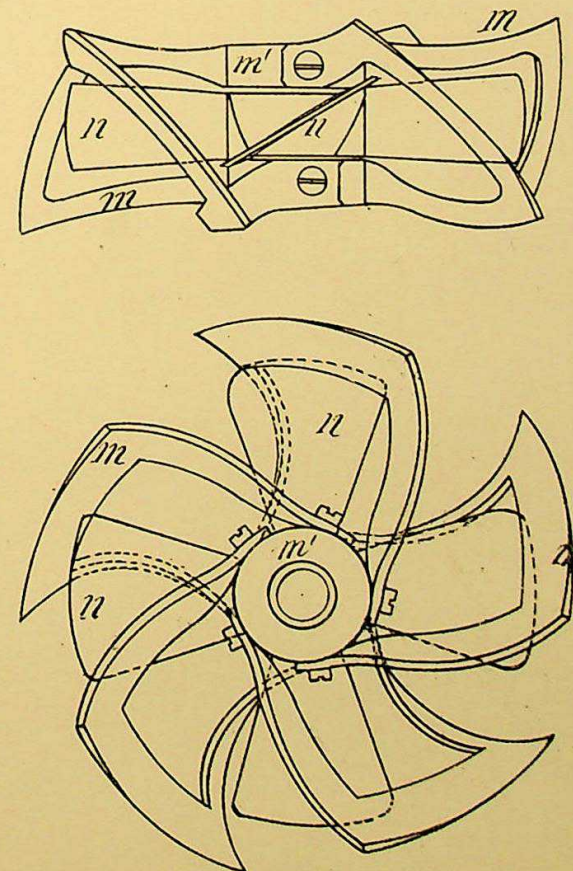


Fig: 4E



21,510 of 1893

115. MARINE PROPULSION.
Screw Propellers.
Form and Construction.

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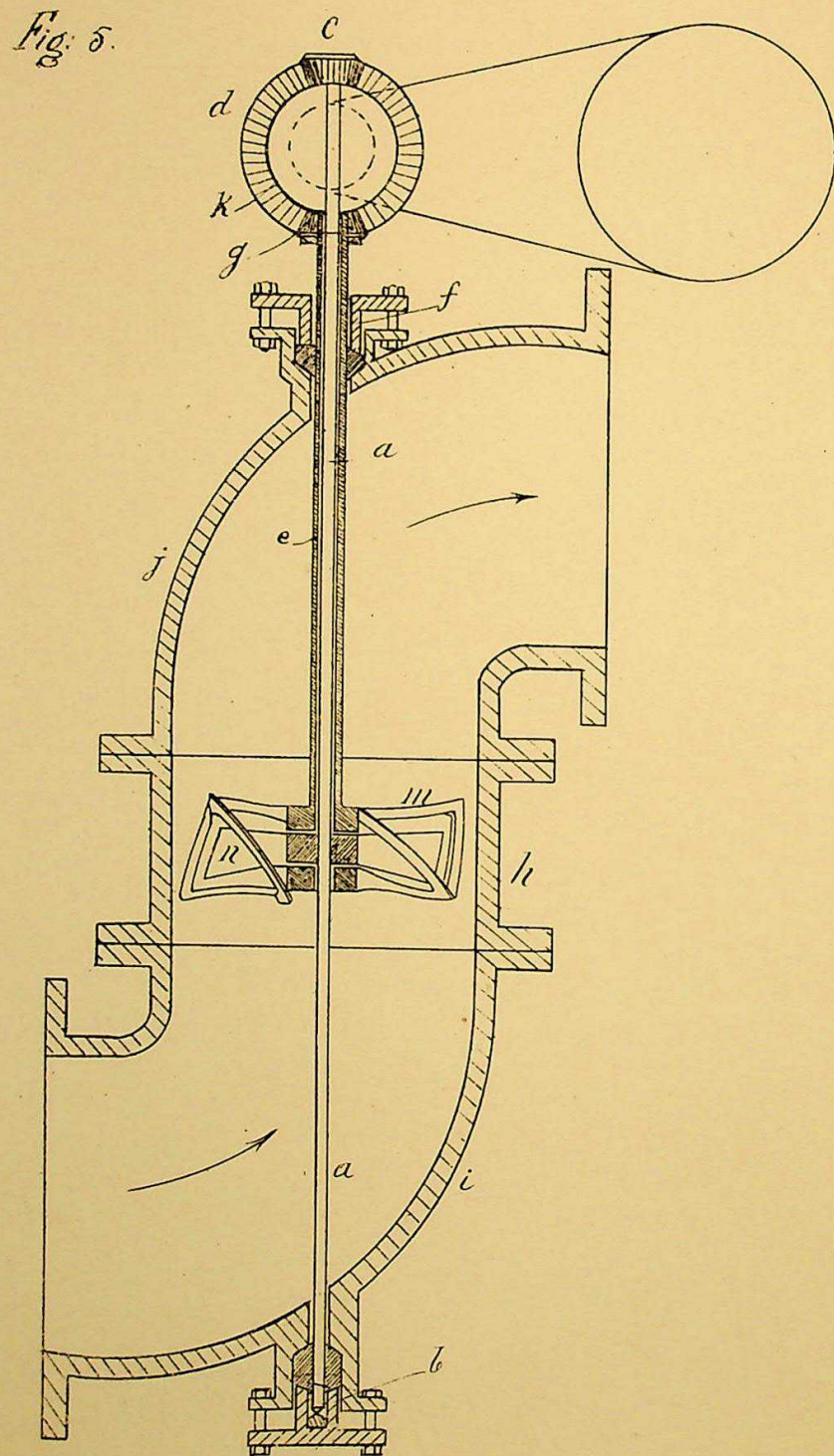


Fig. 6

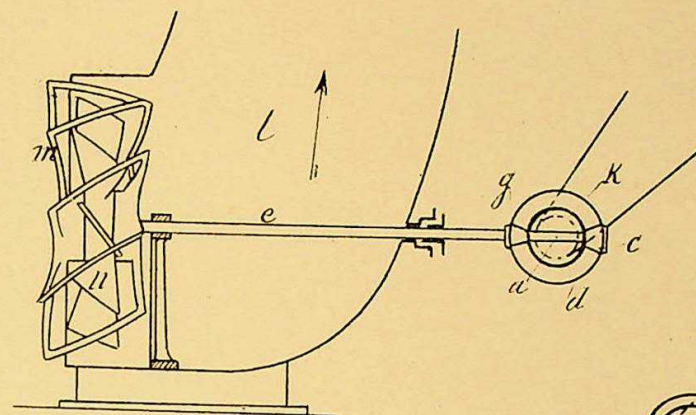


Fig. 7

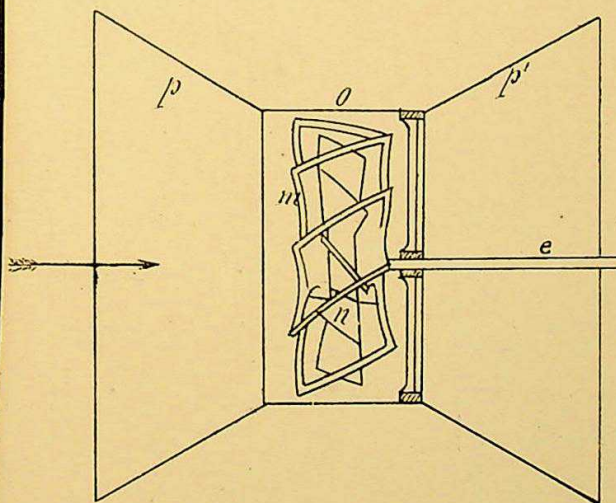
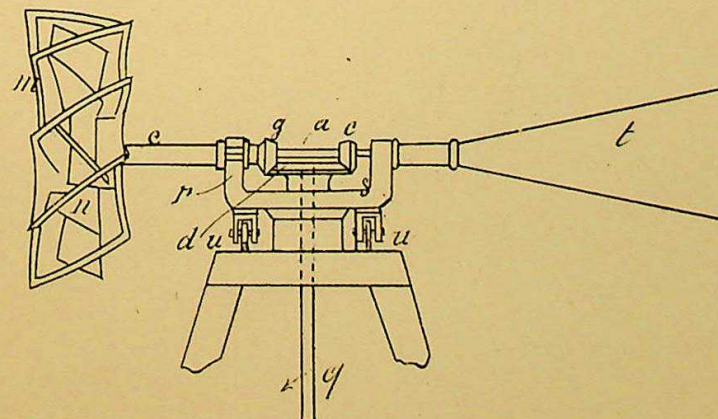


Fig. 8



21,510 of 1893
LIB. MARINE PROPULSION.
Screw Propellers,
Construction and Construction.

[This Drawing is a reproduction of the Original on a reduced scale]



N° 21,510

A.D. 1893

Date of Application, 11th Nov., 1893—Accepted, 25th Aug., 1894

COMPLETE SPECIFICATION.

[Communicated from abroad by PAUL FRÉDÉRIC SCHMIDT, of Levallois-Peuret (Seine), near Paris, France, Electrician.]

Improvements in Propellers and Fluid Motor Wheels.

I, RIDLEY JAMES URQUHART of 57, Barton Arcade, Manchester in the County of Lancaster, Consulting Engineer and Patent Agent do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to screw propellers for propelling ships, balloons and other objects in water or air and for propelling water and air and for water and air motors and consists in an improved construction or arrangement of propellers, the object of my invention being to increase their efficiency or useful effect.

- 10 In the case of propellers as hitherto used, the power of the water put into motion by the same is lost. The propeller imparts to the water a motion partly rotary and partly backwards producing a flow diagonally along the blades outwards and the energy contained in this water in motion is dispersed without being utilized. I propose to utilize it by arranging a second propeller working round the ordinary
- 15 one with the same or a different number of blades inclined in the opposite direction to that of the ordinary propeller and which is rotated in the opposite direction, so that this propeller encounters the current produced by the first propeller and receives or absorbs the motive force contained therein. By working in this way and utilizing the power otherwise lost a greater speed of propulsion is obtained
- 20 from the same motive power with a smaller number of revolutions of the propellers. A third propeller may be arranged rotating round the second one in the same direction with blades inclined as the first one. My invention thus consists in a compound propeller or the combination with the ordinary propeller of one or several opposite propellers surrounding each other and each rotating in the opposite
- 25 direction to the one surrounded by it.

In order that my invention may be more readily understood I have hereunto appended a sheet of drawings on which

- Fig. 1, A shows the inner and outer propeller combined in perspective.
Fig. 1 B the inner propeller separately.
- 30 Fig. 2 a method of driving them in opposite directions.
Fig. 3 a modified arrangement of compound propeller.
Fig. 4 A B C D and E show the compound propeller as preferably arranged for use as a propeller or fan for propelling or forcing air or water and as a wheel for water and wind motors.
- 35 Fig. 5 shows the application of the propeller to a pump,
Fig. 6 its application to a ventilator or fan,
Fig. 7 its application to a water motor or turbine, and
Fig. 8 its application to a wind motor or wind turbine.
On Fig. 1 B, the ordinary propeller is shewn which turns in the direction indicated
- 40 by the arrow *f*.

Fig. 1 A, shows as seen from the end, the same propeller combined with a second outer propeller both of them being made with three blades. This outer propeller turns in the direction indicated by the arrow *f*¹, that is to say in the opposite direction to the inner propeller Fig. 1 B, and its blades

45 direction to the blades " " "

Urquhart's Improvements in Propellers and Fluid Motor Wheels.

Fig. 1 A and B, are intended to illustrate the principle or essential features of my improved compound propeller, the constructive arrangement of which may be carried out in various forms according to the power and purpose of the propeller and the vessel or apparatus to which it is applied.

Figs. 2 and 3 show an arrangement suitable for the propulsion of boats. The inner propeller with three blades *a* is of the ordinary form and is embraced by the blades *b*, of the outer propeller which are formed with openings for the inner propeller to work through, the outer parts being mainly effective and the side parts forming arms to sustain them. The two propellers are driven in opposite directions as indicated by the arrows which may be done as shewn on Fig. 2. The smaller propeller *a* is fixed on a shaft *c*, driven by the engine and the outer propeller *b* on a sleeve *d*, placed loose upon the shaft *c*. A bevil wheel *e* is fixed on the shaft, and a bevil wheel *g* on the sleeve, both bevils gearing with a third carrier wheel *h*, running on a stud or shaft *i*. Any other ordinarily used or known suitable means for rotating the two propellers in opposite directions may be adopted. The outer propeller in my arrangement would have about the same diameter as the ordinary propellers at present in use for the same power and the inner one would be considerably less in diameter, and the surface acting on the water would preferably be made equal in the two propellers, so that the forces balance each other.

The outer propeller blades may also be fixed to a ring *K*, as shewn on Fig. 1 A, the ring being supported by arms from a centre boss, or in any other suitable way. The number of blades in the outer propeller may be the same as in the inner or greater or less.

There may be a third propeller arranged surrounding the second one, with the same direction of the blades and rotation as the first central propeller.

Propellers constructed on my improved plan may be used for propelling ships or navigable balloons or applied for propelling water and air to centrifugal pumps and fans or they may be used as wheels in wind and water motors.

For pumps and fans or motor wheels the propeller is preferably made with a larger number of blades than three. Fig. 4 A shows an internal propeller with five blades *n*, Fig. 4 B the corresponding outer propeller also with five blades *m*, which for facility of manufacture are screwed to two bosses *m*¹ which embrace the boss of the inner propeller; Fig. 4 C shows the compound propeller formed by the two. Fig. 4 D shows a compound propeller with ten blades to each of the component propellers suitable for propelling air or for wind motors. The blades of the inner and outer propellers are inclined in opposite directions as hereinbefore described. It is not necessary that both propellers should have the same number of blades, but they may have different numbers, as shewn by Fig. 4 E where the inner propeller has four and the outer one five blades; and the outer and inner propeller may be in some cases rotated at different speeds or numbers of revolutions and have different angles of inclination to the axis, as may be found most effective for the purpose for which they are used.

Figure 5 shows the application of the compound propeller to a pump. The internal propeller *n* is mounted upon a shaft *a* the lower end of which rests in a foot-step *b* forming a stuffing box; while the upper end has a bevil pinion *c* fixed on it gearing with the bevil wheel *d*. The external propeller *m* is fixed upon a hollow shaft *e* guided at the upper end in a stuffing box *f* and carrying a bevil pinion *g* which gears with the wheel *d*. The compound propeller is placed into a casing *h* with a small clearance between the tips of the blades and the wall of casing *h*. The latter is formed or has fixed to it a lower elbow *i* for the suction, which carries the footstep *b*, and an upper elbow *j* with the stuffing box *f*. On the shaft of the bevil pinion *c* is fixed and driven by a strap from a pulley on the line shaft, or the propeller is driven by a motor or by hand according to the circumstances. The compound propeller propels the water.

Urquhart's Improvements in Propellers and Fluid Motor Wheels.

blades encountering the same in the opposite direction, whence a great efficiency of the pump results.

Figure 6 shows the application of the compound propeller to a ventilator, for which purpose the propellers are preferably made with numerous blades. Motion is imparted to the propellers, which are arranged upon an inner solid and an outer hollow shaft as in the previous applications by means of a pulley *k* on the shaft of bevil wheel *d* and the pinions *c* and *g*; the propeller being enclosed in a suitable casing *l*.

When arranged for a turbine, the propellers are placed within a cylindrical case *o* provided with an inflow cone *p* and outflow cone *p*¹ to which other pipes may be connected according to the position of the turbine or fall of water. The current in the direction of the arrow rotates the propellers *m* and *n*, mounted respectively upon the hollow shaft *e* and internal shaft *a* in inverse directions, which rotation is transmitted through the bevil pinions *g* and *c* and the bevil wheel *d* to the vertical shaft *g* and thence in any suitable way.

Fig. 8 shows the use of the compound propeller as wheel for wind motors or mills. The two propellers *m* and *n* will rotate in opposite directions under the action of the wind and rotate the shaft *g* in the same manner as described with reference to Figure 7. The hollow shaft *e* turns in a pedestal *r* forming part of or fixed to the frame *s*, which is fitted with a vane *t* to turn the propeller into the direction of the wind, and supported on wheels *n* so that it can turn round the centre of shaft *g*.

The compound propeller or wheel gives a greater effect than a single propeller or wheel of the same outside diameter and may be used for motors actuated by a current of any kind of fluids, as well as for propelling fluids of any kind, and for the propulsion of ships or other vessels in liquid or air.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:

1. The arrangement of compound propeller consisting of two or more concentric propellers of different diameters surrounding each other, the blades of each outer propeller being inclined and rotated in the opposite direction to those of the inner one surrounded by it, substantially as hereinbefore described and illustrated by the drawings.

2. In compound propellers arranged as hereinbefore described making the working or acting areas of each propeller approximately equal.

3. The use of compound propellers arranged as hereinbefore described for the propulsion of vessels or their equivalents in water and air, for propelling liquids or air and for wheels in motors actuated by the flow of liquid or air.

Dated the 9th day of November 1893.

R. J. URQUHART,

57, Barton Arcade, Manchester, and 5, Clayton Square, Liverpool,
Consulting Engineer and Patent Agent.